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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/544,822	04/06/2000	Tongbi Jiang	4241US	9308

7590 01/14/2003

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EXAMINER

GRAYBILL, DAVID E

ART UNIT

PAPER NUMBER

2827

DATE MAILED: 01/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/544,822

Applicant(s)

JIANG, TONGBI

Examiner

David E Graybill

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-63 is/are pending in the application.
- 4a) Of the above claim(s) 33-57 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-32 and 58-63 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly the subject matter which applicant regards as the invention.

In claim 9 the term "the surface tension" is unclear because the limitation refers to a "surface tension" but there is no apparent previous claim-recitation of a surface tension. Moreover, the referent of the term cannot be determined.

Claim 9 has not been rejected over the prior art because, in light of the 35 U.S.C. 112 rejections supra, there is a great deal of confusion and uncertainty as to the proper interpretation of the limitations of the claims; hence, it would not be proper to reject the claims on the basis of prior art. As stated in *In re Steele*, 305 F.2d 859, 134 USPQ 292 (CCPA 1962), a rejection should not be based on considerable speculation about the meaning of terms employed in a claim or assumptions that must be made as to the scope of the claims. See also MPEP 2173.06.

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In the rejections infra, reference labels are generally recited only for the first recitation of identical claim language.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1, 2, 4, 5, 7, 10-12, 15, 22 and 58-60 are rejected under 35 U.S.C. 102(e) as being anticipated by Dery (6074895).

At column 1, lines 51-62; column 2, line 52 to column 5, line 11; column 5, lines 51-59; and column 6, lines 13-54, Dery teaches the following:

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1. A method for applying a material between a semiconductor device having a surface and a substrate having a surface, said method comprising: applying a wetting agent layer 111, 124 [before or after plasma treatment] to one of said surface of said semiconductor device 110 and said surface of said substrate 120; and applying a flowable material 140 between the substrate and the semiconductor device.
2. The method according to 1, wherein said semiconductor device is attached to said substrate.
4. The method according to 1, wherein said applying said wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method.
5. The method according to 1, wherein said wetting agent layer comprises at least one layer.
6. The method according to 1, wherein said wetting agent layer comprises one or more layers.
7. The method according to 1, wherein said wetting agent layer comprises a plurality of layers.
10. A method for applying a material between a semiconductor device and a substrate, said method comprising: providing a semiconductor device having an active surface, another surface, a first end, a second end, a first lateral side, and a second lateral side ["all four sides"], said first end, said second

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end, said first lateral side, and said second lateral side forming at least a portion of a periphery of said semiconductor device; providing a substrate having an upper surface, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall; applying a wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate; and applying a flowable material between said semiconductor device and said substrate.

11. The method according to 10, wherein said flowable material is applied substantially adjacent to at least one end of said semiconductor device.

12. The method according to 10, wherein said flowable material substantially fills a gap between said semiconductor device and said substrate.

15. The method according to 10, wherein said flowable material is provided substantially adjacent to said at least a portion of the periphery of said semiconductor device to fill a gap between said substrate and said semiconductor device.

22. The method according to 10, wherein said applying said flowable material comprises: providing said flowable material substantially adjacent said first end ["one or more edges" of said semiconductor device for filling between said substrate and

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said semiconductor device by one or more forces acting upon said flowable material.

58. A method for attaching a semiconductor assembly, said method comprising: providing a semiconductor device having an active surface; providing a substrate having an upper surface; applying a wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate; connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and applying an underfill material between the substrate and the semiconductor device.

59. The method according to 58, wherein applying said wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method.

60. The method according to 58, wherein said wetting agent layer comprises at least one layer.

To further clarify the teaching wherein said applying said wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method, it is noted that it is inherent in the process that the layer is dealt out in portions; therefore, it is inherent that the layer is dispensed.

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 8 and 61-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dery as applied to claims 1, 2, 4, 5, 7, 10-12, 15, 22 and 58-60 and further in combination with Plueddemann (4231910).

Dery does not appear to explicitly teach the following:

3. The method of 1, wherein said wetting agent layer includes a layer of silane-based material.
8. The method according to 1, wherein said wetting agent layer comprises one of glycidoxypentyltrimethoxysilane and ethyltrimethoxysilane.
61. The method according to 58, wherein said wetting agent layer comprises one of silane, glycidoxypentyltrimethoxysilane, and ethyltrimethoxysilane.
62. A method for attaching a semiconductor assembly, said method comprising: applying a silane-based material layer to one

of a portion of said active surface of said semiconductor device and a portion of said upper surface of said substrate.

63. The method according to 61, wherein said wetting agent layer comprises one of glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane.

Nonetheless, at column 1, lines 5-8, 21-23 and 55-63; column 2, lines 5-49; column 3, lines 22-54; column 3, line 65 to column 4, line 10; column 4, lines 24-27 and 58-62; and column 7, line 4 to column 8, line 5, Plueddemann teaches wherein a wetting agent layer comprises one of glycidoxypropyltrimethoxysilane and ethyltrimethoxysilane.

In addition, it would have been obvious to combine the process of Plueddemann with the process because both Plueddemann and Dery are drawn to improving adhesion of a plastic, and the process of Plueddemann would improve the adhesion of the plastic of Dery.

In addition, it has been held that it is obvious to combine two processes for the same purpose. In re Novak 16 USPQ2d 2043. Similarly, "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose [T]he idea of combining them flows logically from their having been

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individually taught in the prior art." In re Kerkhoven, 626 F.2d 846, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a spray - dried detergent by mixing together two conventional spray - dried detergents were held to be prima facie obvious.). See also, In re Crockett, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and Ex parte Quadranti 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (Mixture of two known herbicides held prima facie obvious).

Claims 13, 14, 16-21, and 23-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dery as applied to claims 1, 2, 4, 5, 7, 10-12, 15, 22 and 58-60 supra, and further in combination with Akram (5766982).

Dery does not appear to explicitly teach the following:

13. The method according to 10, wherein said substrate includes an aperture extending through said substrate.
14. The method according to 13, wherein said aperture is located adjacent to said another surface of said semiconductor device.

16. The method according to 10, further comprising: elevating at least said first side wall of said substrate and said first end of said semiconductor device.
17. The method according to 16, wherein said elevating said first side wall of said substrate comprises placing said substrate on a support structure and elevating at least one portion of said support structure.
18. The method according to 16, further comprising: providing a dam on the substrate adjacent to at least one of said first end, said second end, said first lateral side and said second lateral side of said semiconductor device.
19. The method according to 18, wherein said dam extends to substantially between said semiconductor device and said substrate.
20. The method of 10, further comprising: vibrating one of said semiconductor device and said substrate.
21. The method according to 20, wherein said vibrating one of said semiconductor device and said substrate comprises placing said substrate on a support structure and vibrating said support structure.
23. The method according to 10, wherein said substrate includes at least one aperture extending through said substrate and

substantially located adjacent to said another surface of said semiconductor device.

24. The method according to 23, wherein said flowable material is provided through said at least one aperture of said substrate substantially filling a gap between said substrate and said semiconductor device.

27. The method according to 18, wherein said substrate includes at least one aperture extending therethrough and substantially located adjacent to said another surface of said semiconductor device.

29. The method according to 28, wherein said flowable material is provided from below said substrate.

30. The method according to 28, wherein said flowable material is provided through said at least one aperture contacting at least a portion of said another surface of said semiconductor device.

Nevertheless, at column 4, line 36 to column 7, line 17, Akram teaches a process wherein a substrate 10 includes an aperture extending through a substrate, an aperture 60 is located adjacent [nearby] to another surface of a semiconductor device 12; elevating at least a first side wall of the substrate and a first end of the semiconductor device, wherein elevating a first side wall of the substrate comprises placing the substrate

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on a support structure 44 and elevating at least one portion of a support structure; providing a dam 40 on the substrate adjacent to at least one of a first end, a second end, a first lateral side and a second lateral side of a semiconductor device, wherein a dam extends to substantially between a semiconductor device and a substrate; vibrating 48 one of a semiconductor device and a substrate, wherein vibrating one of a semiconductor device and a substrate comprises placing a substrate on a support structure and vibrating a support structure, wherein a flowable material 28 is provided through at least one aperture of a substrate substantially filling a gap 26 between a substrate and a semiconductor device, and wherein a flowable material is provided through a at least one aperture contacting [at least indirect physical contact and thermal contact] at least a portion of another surface of a semiconductor device.

Moreover, it would have been obvious to combine the process of Akram with the process of Dery because it would facilitate applying the flowable material 140 between the substrate and the semiconductor device.

Also, in the combination, Dery teaches the following:

25. The method according to 18, wherein a applying a flowable material comprises: providing a flowable material substantially

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adjacent to a first end of a semiconductor device for filling a gap between a substrate and a semiconductor device.

26. The method according to 18, wherein said applying said flowable material comprises: providing said flowable material substantially adjacent to said first end and one of said first lateral side and said second lateral side of said semiconductor device for filling a gap between said substrate and said semiconductor device.

28. The method according to 27, wherein a flowable material is provided from below a substrate.

Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dery as applied to claims 1, 2, 4, 5, 7, 10-12, 15, 22 and 58-60 supra, and further in view of Banerji (5203076).

Dery does not appear to explicitly teach the following:

31. The method according to 10, wherein said applying said flowable material between said semiconductor device and said substrate further comprises placing said semiconductor device and said substrate in a chamber, said chamber having an atmosphere therein having a variable pressure.

32. The method according to 31, further comprising: varying the pressure of said atmosphere in said chamber for said flowable

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material substantially filling a gap between said semiconductor device and said substrate.

Regardless, at column 2, lines 55-68, and column 3, lines 1-10, Banerji teaches a process wherein applying a flowable material 22 between a semiconductor device 10 and a substrate 20 comprises placing the semiconductor device and the substrate in a chamber 32 having an atmosphere therein having a variable pressure, and varying the pressure of the atmosphere in the chamber for the flowable material substantially filling a gap 18 between the semiconductor device and the substrate.

Furthermore, it would have been obvious to combine the process of Banerji with the process of Dery because it would facilitate applying the flowable material 140 between the substrate and the semiconductor device.

Applicant's amendment and remarks filed 6-3-2 have been fully considered, and are addressed in the rejection supra, are further addressed infra, or have previously been addressed in the record.

Applicant contends that Dery does not teach the limitation, "applying a wetting agent layer."

This contention is respectfully traversed because, although Dery does not appear to recite verbatim the phrase, "applying a wetting agent layer," as explicitly and clearly recited in the

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rejection, Dery explicitly and clearly teaches applying wetting agent layers 111 and 124.

U.S. Manual of Classification, Classification Definition, Class 516, Subclass 198:

198 COMPOSITIONS CONTAINING A WETTING AGENT; PROCESSES OF WETTING; PROCESSES OF PREPARING THE COMPOSITIONS (E.G., SPREADING, PENETRATING, LEVELING):

This subclass is indented under the class definition. Subject matter which is a (1) composition specialized and designed for or peculiar to use in wetting surfaces, (2) mere methods of using such compositions or of using compounds, per se, to perform a process of wetting (3) compositions useful in making compositions for wetting, or (4) methods of making the compositions; which includes uses described by such terms as spreading, penetrating, or leveling.

(1) Note. Agent* refers to the effective material*, energy, or means which acts in the given context. The term agent also includes subcombinations of an agent* composition, such as adjuvants*. (Thus, the term agent* may apply to a compound or composition which may not be fully functional for its stated context, or its functionality may be greatly enhanced by another component which is not present.) Note that although a compound can be an agent*, this class does not provide for compounds, per se. An agent* may be physical or energy.

To further clarify, the layers 111 and 124 are layers specialized and designed for and peculiar to use in wetting surfaces.

Moreover, at paragraphs [0037] and [0038], applicant discloses that the purpose of the wetting layer is to reduce the contact angle of the underfill which is a result of capillary force. Likewise, as cited, Dery teaches that the purpose of the wetting layers 111, 124 is to reduce the contact angle of the underfill 140 which is a result of capillary force. To further clarify, in Dery, although the experimental data tabulated in Table 1 pertains to deionized water underfill contact angle, it

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is clear from the totality of the teachings of Dery that the deionized water underfill contact angle experimental data is intended to illustrate the increased adhesion of the wetting layers resulting in decreased underfill contact angle of the deionized water underfill, and that these results apply generally to underfill 140.

Applicant maintains that layers 111 and 112 are not wetting agent layers until they are plasma treated. This argument is respectfully traversed because, at the least, in concordance with the Classification Definition *supra*, the layers are subcombinations or adjuvants of an agent composition comprising the plasma treated layers. Thus, the pretreated layers are wetting agent layers even though the pretreated layers may not be fully functional for their stated context and their functionality may be greatly enhanced by the plasma treatment. In any case, Dery is also applied to the rejection for the teaching of wetting layers 111, 112 after plasma treatment. To this end, in the response filed 10-7-2, page 13, applicant admits, "it is the gaseous plasma treatment which acts on the inherent surfaces of the integrated circuits and chip carriers [ie, the application of a wetting agent layer] in Dery et al. which achieves the desired reduction in contact angle of the underfill material [ie, which achieves wetting]."

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Also, applicant argues that there is no motivation to combine the processes of Dery and Plueddemann. This argument is respectfully traversed because proper motivation to combine the references has been explicitly and clearly provided in the rejection; namely, "it is obvious to combine two processes for the same purpose," and, "the process of Plueddemann would improve the adhesion of the plastic of Dery." To this end, it is well established that the selection of an art recognized element based on its suitability for its intended use supports a prima facie obviousness determination. See MPEP 2144.07, in particular, *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945); and *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960) (selection of a known plastic to make a container of a type made of plastics prior to the invention was held to be obvious); *Ryco, Inc. v. Ag-Bag Corp.*, 857 F.2d 1418, 8 USPQ2d 1323 (Fed. Cir. 1988) (Claimed agricultural bagging machine, which differed from a prior art machine only in that the brake means were hydraulically operated rather than mechanically operated, was held to be obvious over the prior art machine in view of references which disclosed hydraulic brakes for performing the same function, albeit in a different environment). Therefore, to paraphrase *In re Leshin supra*, selection of the wetting agent of Pleuddemann to make a layer of

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a type made of wetting agent as taught by Dery would have been obvious.

Applicant also traverses the rejection over the combination of Dery and Akram because, allegedly, "Dery requires additional equipment, specifically a plasma chamber, and Akram teaches away from using additional equipment." This allegation is respectfully traversed because Akram does not define or otherwise describe the meaning of the language "additional equipment," and the scope of the language cannot otherwise be determined. As a result, it cannot be concluded that Dery teaches additional equipment. In any case, disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In re Susi, 169 USPQ 423 (CCPA 1971). "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. Merck & Co. v. Biocraft Laboratories, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). Even a teaching away from a claimed invention does not render the invention patentable. See Celeritas Technologies

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Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998), where the court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed." To further clarify, a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose, or even preferability of the invention for another purpose.

Any telephone inquiry of a general nature or relating to the status (MPEP 203.08) of this application or proceeding should be directed to Group 2800 Customer Service whose telephone number is 703-306-3329.

Any telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (703) 308-2947. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.

The fax phone number for group 2800 is 703/308-7722.



David E. Graybill
Primary Examiner
Art Unit 2827

D.G.

10-Jan-03